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ON THE VITALITY OF CERTAIN LAND MOLLUSKS.

BY ROBERT E. C. STEARNS.

AT a meeting of the California Academy of Sciences I submitted for the inspection of the members a living specimen of *Bulimus pallidior* Sby., one of nine given to me by Professor George Davidson, who collected them at San José del Cabo, Lower California, in March, 1873.

These snails were kept in a box undisturbed until June 23, 1875, when I took them out and, after examination, placed them in a glass jar with some chick-weed and other tender vegetable food and a small quantity of tepid water, so as to make a warm humid atmosphere. This hospitable treatment induced them to "wake up" and move about after their long fast and sleep of two years, two months, and sixteen days. Subsequently all died but the one exhibited, which seems to be in pretty good health, though not very active.

It may be remembered that I gave at a meeting of the Academy in March, 1867, an instance, even more remarkable, of vitality in a snail (*Helix Veatchii*) from Cerros Island, the latter having lived without food from 1859, the year when it was collected, to March, 1865, a period of six years.

The famous specimen in the British Museum, which is cited in the books, *Helix desertorum*, had lived within a few days of four years, fastened to a tablet in one of the cases, when discovered to be alive. *Helix desertorum*, as the specific name implies, is found in arid and sterile areas in the continents of Africa and Asia, and has, as will be perceived, a wide distribution. From the former continent, I have specimens from Egypt, and it also ranges through Arabia in the latter. The *Bulimus* from the mainland of the peninsula of Lower California, and *Helix Veatchii* from Cerros or Cedros Island, off the coast on the ocean side of the same, come from within the same physical environment, being only a comparatively limited distance apart. The *Helix* belongs to an interesting and peculiar group, probably varieties of one species, which includes, at present, the following names: (1) *Helix areolata* Sby., (2) *H. Veatchii* Newc., (3) *H. pandoræ* Fbs., and (4) *H. levis* Pfr. Other forms geographically approximate may hereafter on further investigation be referred to the same lineage. Of the above (1) *H. areolata* was the first described, or I should say that this appears by the date to be the first name bestowed upon any member of the group. This species has been quoted from Oregon, and (4) *H. levis* from the Columbia River, in both cases erroneously. The figures in Land and Fresh Water Shells of North America,[1] page 177, are too elevated and globose for the typical *areolata*, but the larger figures faithfully represent *H. Veatchii.* Elevation and rotundity are insular characteristics in this group, and *areolata* is somewhat depressed. It is found in comparative abundance on the uplands around Magdalena Bay, which is on the outer or ocean shore of the peninsula, in latitude about 24° 40′ N.

Bulimus pallidior, which is pretty generally distributed through Lower California, from Cape St. Lucas northerly, has also erroneously been credited to San Diego in California proper.

It is arboreal in its habits, at least during the winter season, being found on copaiva trees. It has been said to inhabit South America, which is probably incorrect, and the locality "San Juan" mentioned in Land and Fresh Water Shells, on page 195, where a good figure of this species may be seen, should be *San Juanico*, which is on the east or gulf side of the peninsula, in latitude about 27° N.

The great importance of accuracy in habitat will be at once perceived when I state that there are no less than *three* other localities on the west coast of America, *north* of the place cited, all of which are referred to in various scientific works, which have come under my observation as San Juan, and there are perhaps as many more San Juans, *south* of that especially quoted herein, on the westerly coast of America, in the Central and South American States. Attention is directed to the fact that the three species here mentioned as exhibiting extraordinary vitality belong to geographical areas which receive only a minimum rainfall, or which are, in simple language, nearly rainless regions.

Within such areas vegetation is exceedingly limited even in favorable seasons, and the presence and growth of the annual plants is of course dependent upon the rainfall; this last occurring infrequently makes the food supply of land mollusks and other phytophagous or vegetable-eating animals exceedingly precarious.

It is highly probable that a careful investigation in this direction will lead us to the conclusion that the land mollusks which inhabit these arid areas have, through selection, adaptation, and evolution, become especially fitted for the contingencies of their habitat, and possess a greater degree of vitality or ability to live without food than related forms in what may be considered more favorable regions, and through and by reason of their long sleep or hibernation (more properly æstivation), with its inactivity and consequent immunity from any waste or exhaustion of vital strength, are enabled to maintain their hold upon life when animals more highly organized would inevitably perish ; and we are furnished with an illustration in the instances cited, how nature works compensatively, when we institute a comparison with the opposite condition of activity, and the food required to sustain it.

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[1] Smithsonian Misc. Coll., No. 194.

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BARNACLES.

BY J. S. KINGSLEY.

QUAINT old Gerarde in his Herball, or Generall Historie of Plantes, says, on page 1391, " We are arrived to the end of our historie, thinking it not impertinent to the conclusion of the same, to end with one of the marvels of this land (we may say of the world). . . . . There are founde in the north parts of Scotland, and the islands adjacent, called Orchades, certaine trees whereon doe growe certaine shell fishes, of a white colour, tending to russet, wherein are contained little living creatures ; which shels, in time of maturitie, doe open, and out of them growe those little living things which falling into the water doe become fowles, whom we call Barnakles, in the North of England Brant Geese, and in Lancashire Tree Geese : but the other that doe fall upon the land perish and come to nothing." He then goes on to describe in detail the various transformations by which the barnacle is changed into a goose, saying, " But what our eies have seene and hands have touched, we shall declare." He tells us that when the bird is formed in the shell, the latter gapes, the legs hang out, the bird grows larger, until at length it hangs only by the bill and soon after drops into the water, " where it gathereth feathers and groweth to a fowle bigger than a mallard and lesser than a goose."

A quotation in Walton's Complete Angler repeats the same curious notion : —

> " So slow Boötes underneath him sees
> In th' icy islands goslings hatched of trees,
> Whose fruitful leaves falling into water
> Are turned tis known to living fowls soon after.